Studies of phytochemical constituents of medicinal plant and their impacts on pathogen

Synopsis

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INTRODUCTION

Natural plant products play a significant role in pharmaceutical industry because these are the best sources of drugs (Koehn and Carter, 2005; Newman *et al*., 2016; Li and Vederas, 2009; Pye *et al*., 2017). India is well known for their practice of traditional medicine and ethno pharmacology (Pandey *et al*., 2013). It is interesting that traditional Indian medicinal formulations are multi-component mixtures whose therapeutic value is dependent upon empirical knowledge rather than a mechanistic understanding of the active ingredients in the mixture (Pandey *et al*., 2013). Knowledge of traditional Indian medicine including important medicinal plants and their formulations are gathered in books such as Indian Materia Medica (Nadkarni and Nadkarni, 1955) and Ayurveda Materia Medica (Dash and Kashyap, 1999). Polur *et al*. (2011) have compiled information on 295 Ayurvedic Indian medicinal plants, their 1829 phytochemicals and therapeutic uses. Subsequently, Polur *et al*. (2011) studied the structural similarity between of 1829 phytochemicals and drugs in the Drug Bank (Law *et al*., 2014) database to predict pharmacologically active natural compounds. Recently, Pathania *et al*., (2015) have gathered information on five Indian medicinal plants and their 963 phytochemicals in a database.

Phytochemicals plays an important role in the treatment of various human diseases. Over the past 25 years, 50% of herbal drugs have been developed from medicinal plants (Chang *et al*., 2013). These drugs have emerged as unique, safe, effective, and relatively inexpensive remedies producing minimal or no side effects (Heinrich *et al.*, 2012). The isolation and formulation of active constituents from medicinal plants along with their pharmacological and toxicological evaluation are the need of the modern therapeutics. Ayurveda and other traditional medicinal system for the treatment of human diseases a number of plants used as herbal drugs. Hence, they play an important role as alternative medicine due to less side effects and low cost.

Several reputed medicinal plants constitute the natural component of Indian flora. These are: *Dioscorea deltoidea, D. prazeri, Atropa acuminata, Aconitum heterophyllum, A. ferox, A. chasmanthum, Ephedra gerardiana, Nardostachys grandiflora, Rauvolfia serpentina, Saussurca sacra, S. lappa, Coptis teeta, Chlorophytum arundinaceum, Gentiana kurroo, Mesua ferrea, Swertia chirayita, Orchis latifolia, Urgenia indica, Colchicum luticum, Podophyllum hexandrum, Thymus serphyllum, Curculigo orchioides, Angelca glauca, Prangos pabularia, Artemesia annua, Onosma bracteatum, Carum bulbocastannum, Valeriana jatamansi, Hydnocarpus kurzii, Holarrhcna antidysenterica, Ferula jaeschkeana, Salvia moorcroftiana, Phyllanthus fraternum, Withania somnifera, Andrographis paniculata, Crataeva nurvala, Berberis* spp. There is, however, successive losses in population numbers and also changes in distribution range over a period of time. It is now well-realised that some of these medicinal plants are highly endangered.

OBJECTIVES:

The present work is aimed to study the phytochemicals and their active principles of some important medicinal plants of North Bihar with the following objectives:

- Collection, validation and preparation of plant extract after conducting literature survey concerning selected plants and its active phytochemicals used to treat diabetes.
- Analysis of Phytochemicals of medicinal plants qualitatively as well as quantitatively through Thin Layer chromatography (TLC) or High-Performance liquid chromatographic (HPLC) assays of plant extracts for the presence of active compounds.
- Molecular investigation of validated compound identified for their biochemical activity.

REVIEW OF LITERATURES

The importance of medicinal plants in the management of human diseases have been reviewed by Liu *et al*., (2007), Wadood *et al*., (1989), Akhtar *et al*., (1991), Andrade-Cetto *et al*., (2004), El Hilaly *et al*., (2002), Eidi *et al*., (2005), Jain *et al*., (2010), Panda *et al*., (2007), Ribnicky, (2009), Yu *et al*., (2006), Waheed *et al*., (2006), Fuentes *et al*., (2004), Lino *et al*., (2004), Russell *et al*., (2008), Kannur *et al*., (2006), Gupta *et al*., (2010), Kang *et al*., (2010), Nampoothiri *et al*., (2010) etc.

Some recent review of literatures

Mohd. Mazid *et al*., (2012) have reviewed medicinal plants of rural India.

Firdous (2014) studied the phytochemicals of various medicinal plants used in the treatment of diabetes.

Switi *et al.,* (2014) have thoroughly reviewed the phytochemicals for management of diabetes.

Chetna Mishra *et al*., (2015) have thoroughly reviewed the role of phytochemicals in diabetes lipotoxicity.

Karthikeyan Mohanraj *et al*., (2018) have compiled a curated data base of Indian medicinal plants, phytochemistry and therapeutics.

Tripuresh Dwivedi *et al*., (2019) have prepared a list of some important medicinal plants with their medicinal uses from Himalayan State, Uttarakhand (India).

Baidyanath Kumar *et al*., (2021) have studied in vitro antioxidant activity of *Trigonella foenum-gracaeum* Linn.

Baidyanath Kumar *et al*., (2021) have studied the hypoglycemic activity of methanol extracts of some medicinal plants on streptozotocin induced mice diabetic models.

After these investigations no significant work has been carried out on the phytochemicals and their active principles of medicinal plants of North Bihar. Hence the present research project has been proposed for my Ph. D work. Some known medicinal plants of North Bihar are *Catharanthus roseus* (Sadabahar), *Trigonella foenum-graceum, Opuntia ficus-indica* (Nopal), *Allium sativum* (cultivated garlic), *Costus igneus* (Insulin plant)/*Chamaecostus cuspidatus* (Insulin Plant), *Aconitum napellus*, *Adhatoda vasica Panax quinquefolius* (American Ginseng), *Withania somnifera*, *Stropanthus hispidus, Carcuma longa* (Turmeric), *Zingiber officinale* (Ginger), *Emblica officinalis* (Amla), *Saraca asoca* (Ashok), *Black asphaltum* (Shilajit), *Azadirachta indica* (Neem) etc. These plants are being used in the management of certain human diseases. Therefore, the problem demands due attention at scientific level to investigate the phytochemicals of different parts of some of these medicinal plants and their active principles used in the treatment of certain human diseases with the help of some modern tools and techniques.

METHODOLOGY AND PLANNED WORK:

Collection of Medicinal plants: Medicinal plants used as traditional medicines will be collected from some specific areas of North Bihar viz. Begusarai, Samastipur, Darbhanga and Madhubani. These areas come under Indo-Gangetic plain of Bihar. Medicinal plants will be identified following Indian Pharmacopoeia (2018) and taxonomically enumerated.

Some indigenous and most common medicinal plants are *(Abelmoschus esculentus* (Okra), *Momordica Charantia* (Bitter guard), *Alliumcepa* (Onion), *Allium Sativum* (cultivated garlic), *Camellia sinensis* (Green Tea), *Aloe vera* (Aloe indica), *Panax quinquefolius* (American Ginseng), *Chamaecostus cuspidatus* (Insulin Plant), *Carcuma longa* (Turmeric), *Zingiber officinale* (Ginger), *Emblica officinalis* (Amla), *Saraca asoca* (Ashok), *Black asphaltum* (shilajit), *Azadirachta indica* (Neem), *Catharanthus roseus* (Sadabahar), and *Opuntia ficusindica* (Nopal),

Materials used: Materials, laboratory equipments and reagents used in the present study will be flasks, beakers, test tubes, funnel, measuring cylinders, pipettes, Petri dishes, Pasteur pipettes, Rotary Vacuum Evaporator, Balance, Grinding mach, Oven, Distilled water, Incubator, BOD incubator, Centrifuge, autoclave etc.

The reagents used will be Methanol, Ferric chloride ($FeCl_3$), Hydrochloric acid (HCl), Dragendroff reagent, glacial acetic acid (GAA), sulphuric acid (H_2SO_4), chloroform ($CHCl_3$), Acetone, Petroleum ether, Ethanol, Benzene, Methanol, Distilled water, Hexane, acetic anhydride, ammonia solution, Fehling's solution A and B, ammonium hydroxide (NH4OH), ethyl acetate, Folin-Denis reagent, sodium carbonate (Na_2CO_3), isobutyl alcohol, magnesium carbonate ($MgCO_3$), ether, pentanol, gallic acid, Folin- Ciocalteu reagent, aluminium chloride ($AlCl_3$), potassium acetate etc. All reagents used will be of AR quality, and will be purchased from Merck and Himedia.

The UV spectrophotometer will be used for the measurement of absorbance of different extracts under study.

Phytochemical analysis: Phytochemicals of medicinal plants viz. *Catharanthus roseus, trigonella foenum-graceum,Costus igneus, Adhatoda vasaka, withania somnifera, Emblica officinalis, Saraca asoca, Panax quinquefolius, Zingiber officinalis* and *Azadirachta indica* will be assayed quantitatively as well as qualitatively following the methods of Sofowara (1993), Trease and Evans (1989) and Harborne (1973).

Extracts of these medicinal plant parts will be prepared according to the Ayurvedic Pharmacopoeia of India (2011). Active phytochemicals of these medicinal plants will be evaluated using TLC or HPLC. Experiments will be carried out in the replicates of three and data will be statistically analyzed by measuring SE, SD and critical difference at 5% level and by one way analysis of variance (ANOVA).

Plan of Works-

First year Plan:
Survey and collection of Medicinal plants and their identification and taxonomic enumerations.

Second Year Plan:

Phytochemical analysis and efficacy of medicinal plants on pathogens

Third Year Plan:
Computation and compilation of Ph. D Thesis and its submission

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